Curriculum Vitae

Dr. Osni A. Marques

Staff Scientist, Lawrence Berkeley National Laboratory
Assistant Researcher, University of California at Berkeley

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Work Address:
  Lawrence Berkeley National Laboratory
  High Performance Computing Research Department
  1 Cyclotron Road, MS 50F-1650
  Berkeley, CA 94720-8139
  Phone: (510) 486-5290
  Fax: (510) 486-5812
Home Address:
  260 Caldecott Lane #108
  Oakland, CA 94618-2414, USA
  Phone: (510) 704-9769

Citizenship: Brazil (permanent resident of the USA)
E-mail: *oamarques@lbl.gov*, *osni@cs.berkeley.edu*
URL: *http://crd.lbl.gov/~osni*

Summary of Education and Professional Activities

Academic Degrees:

- D.Sc.   Structural Engineering, COPPE/UFRJ, Rio de Janeiro, Brazil, 1991
- M.Sc.   Structural Engineering, COPPE/UFRJ, Rio de Janeiro, Brazil, 1986
- A.B.   Civil Engineering, State University of Londrina, Brazil, 1983

Professional Experience:

- Principal Investigator of the project *Advanced CompuTational Software (ACTS) Collection*, funded by the Mathematical, Information, and Computational Sciences (MICS) Division of the US Department of Energy (DOE), starting in 2003.
- Principal Investigator of the project *Improving the Usability and Effectiveness of the Advanced Computational Testing and Simulation (ACTS) Toolkit*, funded by the MICS Division of DOE, from 2000 to 2002.
- Development and implementation of numerical algorithms in the framework of the LAPACK and ScaLAPACK projects, and the National Science Foundation (NSF) NPACI Program. University of California, Berkeley, Department of Computer Sciences, from 1997 to 2004.

- Development and implementation of algorithms for the solution of inverse problems from applications in Earth Sciences. Lawrence Berkeley National Laboratory, from 1997 to 2000.
- Researcher, numerical linear algebra algorithms, CERFACS, Toulouse, France, from 1995 to 1996.
- Postdoctoral fellow, numerical linear algebra algorithms, CERFACS, Toulouse, France, from 1993 to 1994.
- Teaching assistant, COPPE/UFRJ, Rio de Janeiro, Brazil, 1987 and 1992.
- Instructor of Mathematics and Physics, Colégio São Paulo, Londrina, Brazil, from 1980 to 1983.
- Practice in structural design, Londrina, Brazil, 1983.

Industrial Research / Technology Transfer:

- Consultant, Inktomi Corporation, San Mateo, California, 1997 and 1998. Numerical linear algebra algorithms.
- Research associate, PETROBRAS (Brazilian Petroleum Company), Rio de Janeiro, Brazil, from 1987 to 1991.
- Consultant, INPE (Brazilian Institute for Spatial Research), São José dos Campos, Brazil, 1990. Structural analysis of the satellite CBERS-1 (China-Brazil Collaboration).

Refereeing Services:

- DOE
- NSF
- International Journal for Numerical Methods in Engineering,
- ACM TOMS
- Numerical Linear Algebra with Applications
- Electronic Transactions on Numerical Analysis (ETNA)
- Finite Elements in Analysis and Design
- Computational and Applied Mathematics
- Journal of Computing and Information Technology
- International Conference on Preconditioning Techniques for Large Sparse Matrix Problems in Industrial Applications
- International Parallel and Distributed Processing Symposium
- *Generation of Bases for Dynamic Responses: Effects of the Loading Frequency Components*, D.Sc. Thesis (in Portuguese), S. F. Silva Neto, COPPE/UFRJ, Rio de Janeiro, Brazil, 1992

Other Courses:

- Advanced Structural Analysis Using the MSC/NASTRAN Program, INPE (Brazilian Institute for Spatial Research), São José dos Campos, Brazil, February 1991
- Theoretical and Applied Mechanics, 3rd Module, LNCC (National Laboratory for Scientific Computation), Rio de Janeiro, Brazil, July 1985.

Memberships:

- SIAM
- IEEE

Fluent Languages:

- Portuguese
- English
- French

Research Activities

Current Interests:

- Algorithms for the solution of large eigenvalue problems in material science calculations.
- Software tools to simplify the solution of common and important computational problems and to facilitate the development of complex simulation codes.
- Integration of numerical algorithms in OpenSees (a parallel object-oriented finite element program intended for large seismic simulations), in collaboration with Profs. G. Fenves and J. Demmel, University of California, Berkeley.
- Algorithms for the computation of eigenvalues of symmetric tridiagonal matrices with high relative precision, in collaboration with Prof. B. Parlett, University of California, Berkeley.
- Applications in Earth Sciences, in collaboration with D. Vasco, Lawrence Berkeley National Laboratory.
- Parallel and scientific computing.

Publications:

- *The Advanced CompuTational Software (ACTS) Collection.* T. Drummond and O. Marques. ACM TOMS, 31:282-301, 2005.
- *Building A Software Infrastructure for Computational Science Applications: Lessons and Solutions*. Proceedings of the SE-HPCS'05 Conference. Technical Report LBNL-58362.
- *A Survey of High-Quality Computational Libraries and Their Impact in Science and Engineering Applications*, T. Drummond, O. Marques, J. Roman and V. Vidal. Lecture Notes in Computer Science, Vol. 3402, Springer-Verlag, Berlin, 2005. VECPAR 2004, Valencia, Spain, June 28-30, 2004, revised selected and invited papers. Technical Report LBNL-58371.
- *An Expanded Framework for the Advanced Computational Testing and Simulation Toolkit*, Technical Report LBNL-54033, November 11, 2003.
- *An Infrastructure for the Creation of High End Scientific and Engineering Software Tools and Applications*, Technical Report LBNL/PUB-3176, April 1, 2003.
- *The ACTS Collection, Robust and High-Performance Tools for Scientific Computing: Guidelines for Tool Inclusion and Retirement*, Technical Report LBNL/PUB-3175, November 15, 2002.

- *ACTS - A Collection of High Performing Software Tools for Scientific Computing*, Technical Report LBNL-53897, November 1, 2002.
- *The Advanced Computational Testing and Simulation Toolkit (ACTS)*, Technical Report LBNL-50414, May 21, 2002.
- *A Computational Strategy for the Solution of Large Linear Inverse Problems in Geophysics*, O. Marques, T. Drummond and D. W. Vasco, in proceedings of the International Parallel and Distributed Processing Symposium, Nice, France, 2003.
- *Resolution, Uncertainty and Whole Earth Tomography*, D. W. Vasco, L. R. Johnson and O. Marques, Journal of Geophysical Research, Solid Earth, 108, Jan 10, 2003.
- *On Computing Givens Rotations Reliably and Efficiently*, D. Bindel, J. Demmel, W. Kahan and O. Marques, ACM TOMS, 28:206-238, 2002.
- *Geodetic Imaging: Reservoir Monitoring using Satellite Interferometry*, D. W. Vasco, C. Wicks Jr., K. Karasaki and O. Marques, Geophysical Journal International, 149:555-571, 2002.
- *The Advanced Computational Testing and Simulation Toolkit (ACTS)*, T. Drummond and O. Marques, Technical Report LBNL-50414, Berkeley, USA, 2000.
- *A Building Block Approach for Determining Low-frequency Normal Modes of Macromolecules*, F. Tama, F. X. Gadea, O. Marques and Y.-H. Sanejouand, Proteins: Structure, Function and Genetics, 41:1-7, 2000.
- *An Implementation of the dqds Algorithm (positive case)*, B. N. Parlett and O. Marques, Linear Algebra and its Applications, 309:217-259, 2000.
- *Solving Large Linear Inverse Problems in Geophysics by Means of Eigenvalue Calculations*, O. Marques and D. W. Vasco. Technical Report LBNL-45324, Berkeley, USA, 2000.
- *Global Earth Structure: Inference and Assessment*, D. W. Vasco, L. R. Johnson and O. Marques, Geophysical Journal International, 137:381-407, 1999.
- *Large-scale SVD and Subspace-based Methods for Information Retrieval*, H. Zha, O. Marques and H. D. Simon, Solving Irregularly Structured Problems in Parallel (Proceedings of the Irregular'98 Conference), Lecture Notes in Computer Science, 1457:29-42, Springer Verlag, 1998.
- *Eigensolvers and Applications in Finite Element Analyses*, Advanced Solution Procedures on Innovative Computer Architectures, pp. 66-79, CIMNE Publications, Barcelona, Spain, 1996.
- *Hinge-Bending Motion in Citrate Syntase Arising from Normal Modes Calculations*, O. Marques and Y.-H. Sanejouand, Proteins: Structure, Function and Genetics, 23:557-560, 1995.
- *Protein Motions through Eigenanalyses: A Set of Study Cases*, O. Marques and Y.-H. Sanejouand, CERFACS Report TR/PA/95/32, Toulouse, France, 1995.
- *BLZPACK: Description and User's Guide*, CERFACS Report TR/PA/95/30, Toulouse, France, 1995.
- *Pseudoconsistent Load Vector and Mass Matrix for the Discrete Kirchhoff Triangle and the Discrete Shear Triangle Elements*, R. M. Sydenstricker, A. L. G. A. Coutinho, L. Landau and O. Marques, Communications in Numerical Methods in Engineering, 11:317-330, 1995.
- *Spectral Portrait Computations by a Lanczos Method, Augmented Matrix Version*, O. Marques and V. Toumazou, CERFACS Report TR/PA/95/05, Toulouse, France, 1995.

- *Spectral Portrait Computations by a Lanczos Method, Normal Equation Version*, O. Marques and V. Toumazou, CERFACS Report TR/PA/95/02, Toulouse, France, 1995.
- *An Interactive Complex Hermitian-Lanczos Eigensolver*, CERFACS Report TR/PA/94/16, Toulouse, France, 1994.
- *A Partitioned Skyline LDL^T Factorization*, CERFACS Report TR/PA/93/53, Toulouse, France, 1993.
- *Optimization of a Symmetric Block Lanczos Basis Generation Process*, CERFACS Report TR/PA/93/52, Toulouse, France, 1993.
- *Some Results on the Implementation of the Cimmino Method on the Hipercube iPSC/860*, in Portuguese, B. M. T. Neitzel, E. F. N. Siqueira, L. C. Coelho, N. F. F. Ebecken and O. Marques, RBE (Revista Brasileira de Engenharia), Caderno de Estruturas, 10:55-74, 1993.
- *Free Vibration Analysis of Composite Structural Materials*, in Portuguese, R. M. Sydenstricker, O. Marques and L. Landau, Proc. of the XIII CILAMCE, Congresso Ibero Latino-Americano sobre Métodos Computacionais para a Engenharia, 1:305-314, Porto Alegre, Brazil, November 1992.
- *Numerical and of Free Vibrations Analyses of Composite Laminated Plates using Finite Elements*, in Portuguese, R. M. Sydenstricker, O. Marques and L. Landau, Proc. of the 7th SIBRAT, Simpósio Brasileiro sobre Tubulações e Vasos de Pressão, 1:329-340, Florianópolis, Brazil, October 1992.
- *Structural Dynamic Analysis Using a Block Lanczos Algorithm*, in Portuguese, O. Marques and L. Landau, Proc. of the XXV Jornadas Sul-Americanas de Engenharia Estrutural, 3:13-24, Porto Alegre, Brazil, November 1991.
- *A Survey of Lanczos Algorithms for Dynamic Analysis of Offshore Structures*, O. Marques and L. Landau, Proc. of the 8th International Symposium on Offshore Engineering, Brazil Offshore'91, Pentech Press:363-377, Rio de Janeiro, Brazil, August 1991.
- *Block Lanczos Algorithm for Dynamic Analysis of Offshore Structures Under Multiload Patterns*, O. Marques and L. Landau, Proc. of the First International Offshore and Polar Engineering Conference, 4:1-7, Edinburgh, Scotland, August 1991.
- *On the Utilization of a Block Lanczos Algorithm in Free Vibration Analysis of Offshore Structures*, O. Marques and L. Landau, International Journal of Offshore and Polar Engineering, 3:219-224, 1993.
- *Selective Determination of Vibration Frequencies by the Lanczos Method*, O. Marques and L. Landau, Proc. of the 7th International Symposium on Offshore Engineering, Brazil Offshore'89, Pentech Press, pp. 180-191, Rio de Janeiro, Brazil, August 1989.
- *Free Vibrations of 2D Beam Structures Under Initial Stresses Considering Geometric Non Linearities*, in Portuguese, O. Marques, L. F. B. Ribeiro and V. Karam, Proc. of the MECOM 88, IX Congresso Latino-Americano sobre Métodos Computacionais para Engenharia e II Congresso Argentino de Mecânica Computacional, Cordoba, Argentina, November 1988.
- *A Hybrid Algorithm for the Solution of Tridiagonal Eigenvalue Problems*, in Portuguese, O. Marques, L. G. A. Coutinho and L. Landau, Proc. of the X Congresso Nacional de Matemática Aplicada e Computacional, 2, pp. 542-549, Gramado, Brazil, September 1987.
- *A Comparison of Algorithms for the Free Vibration Analysis of Offshore Structures*, O. Marques, A. L. G. A. Coutinho and L. Landau, Proc. of the 6th International Symposium on Offshore Engineering, Brazil Offshore'87, Pentech Press, pp. 474-494, Rio de Janeiro, Brazil, August 1987.

- *Solution of Large Eigenvalue Problems Using the Algorithm of Lanczos*, in Portuguese, O. Marques, A. L. G. A. Coutinho and L. Landau, Proc. of the Colloquia 1987, XXIV Jornadas Sul-Americanas de Engenharia Estrutural, Vol. 4, pp. 185-201, Porto Alegre, Brazil, July 1987.
- *A Study of Algorithms for the Solution of Large Eigenvalue Problems*, in Portuguese, O. Marques, A. L. G. A. Coutinho and L. Landau, Proc. of the VII Congresso Latino-Americano sobre Métodos Computacionais para Engenharia, Vol. III, pp. 1313-1329, SãoCarlos, Brazil, November 1986.
- *Utilization of the Block Lanczos Algorithm for Structural Dynamic Analysis*, D.Sc. Thesis (in Portuguese), COPPE/UFRJ, Rio de Janeiro, Brazil, 1991.
- *Solution of Generalized Eigenproblems Using the Block Subspace Iteration Method and the Lanczos Algorithm with Selective Orthogonalization*, M.Sc. Thesis (in Portuguese), COPPE/UFRJ, Rio de Janeiro, Brazil, 1986.

Talks and Presentations:

- *ACTS: A Software Infrastructure for Computation Sciences*, Computational Science Research Center San Diego State University April 15, 2005
- *Robust and High Performance Libraries for Computational Sciences*, short course on the ACTS Collection (jointly with T. Drummond and J. Roman) at the SIAM CSE05 Conference, Orlando, FL, February 11, 2005.
- *The ACTS Collection: A Software Infrastructure for Scientific Computations on High-End Computers*, New Methods for Developing Peta-Scalable Codes Workshop. Pittsburgh Supercomputing Center, PA, May 3-4, 2004.
- *The ACTS Collection: Robust and High Performance Libraries for Computational Sciences*, short course (jointly with T. Drummond, S. Li and J. Meza) on the ACTS Collection at the SIAM PP05 Conference, San Francisco, CA, February 27, 2004.
- *Building a Reliable Software Infrastructure for Scientific Computing*, Computer Science Colloquia, University of Iowa , October 30, 2003.
- *The DOE Advanced Computational Software (ACTS) Collection: Reliable Software for Scientific Computing,* Richard Tapia Celebration of Diversity in Computing Conference 2003, Atlanta, GA, October 16, 2003.
- *Encurtando a Distância entre o Desenvolvimento e a Utilização de Algoritmos Numéricos em Aplicações Científicas,* XXVI Congresso Nacional de Matemática Aplicada e Computacional, São José do Rio Preto, Brasil, September 8, 2003.
- *High Performance Numerical Libraries for Scientific Computing*, Minisymposium presented jointly with Iain Duff, Juan Meza and Jorge More, ICIAM 2003, Sydney Australia, July 10, 2003.
- *The DOE Advanced CompuTational Software (ACTS) Collection: A Reliable Software Infrastructure for Scientific Computing*, UC Davis CS Colloquium, February 6, 2003.
- Birds-of-a-feather (jointly with T. Drummond). *The ACTS Collection Certification Process,* and presentation at the LBNL/NERSC Theater on *The Advanced CompuTational Software (ACTS) Collection*, SC 2002, Baltimore, MD, November 16-22.
- *ScaLAPACK*, Workshop on the ACTS Collection: Robust and High Performance Tools for Scientific Computing, Lawrence Berkeley National Laboratory, CA, September 4-7, 2002.

- *The Advanced Computational Software (ACTS) Collection*, SCICOMP 6, Berkeley, CA, August 23, 2002.
- *ACTS Workshop* (jointly with T. Drummond), IMA 2002 Summer Program, University of Kentucky Center for Computational Sciences, Lexington, KY, July 18-19.
- Scaling to New Heights Workshop, Pittsburgh Supercomputing Center, PA, May 20-21, 2002.
- *The ACTS Toolkit: Bridging the Gap Between Software and Application Developments*, Stanford University SCCM Seminars, April 15, 2002.
- *Workshop on High Performance Numerical Libraries for Science and Engineering* (jointly with A. Canning), Seventh Copper Mountain Conference on Iterative Methods, April 10-12, 2002.
- *Tutorial on High-Performance Math Libraries* (jointly with J. Demmel and T. Drummond), NPACI All-Hands Meeting, San Diego, CA, March 06, 2002.
- *An Overview of ScaLAPACK*, Workshop on High-performance Numerical Libraries for Science and Engineering, LACSI Symposium, Santa Fe, NM, October 18, 2001.
- *ScaLAPACK (an introduction)*, ACTS Toolkit Workshop, Solving Problems in Science and Engineering, Lawrence Berkeley National Laboratory, October 10-13, 2001.
- *Trends in High Performance Computing and the ACTS Toolkit Project*, CENAPAD-SP, Campinas, Brazil, August 29, 2001.
- *The Computation of Accurate Singular Values Using the dqds Algorithm*, International Workshop on Numerical Linear Algebra, Numerical Methods for PDEs and Optimization, Curitiba, Brazil, August 20-23, 2001.
- Lectures on the state-of-the-art algorithms for the solution of large scale eigenvalue (and applications), Advanced School on Recent Developments in Large Scale Scientific Computing Porto, Portugal, July 3-6, 2001.
- Tutorial on *High-Performance Numerical Linear Algebra: Fast and Robust Kernels for Scientific Computing* (jointly with J. Demmel and J. Dongarra), NPACI AHM 2001, San Diego, CA. February 25, 2001.
- Birds-of-a-feather (jointly with T. Drummond) *The ACTS Toolkit Development,* presentation at the LBNL/NERSC Theater, *What can ACTS do for you?*, SC 2000, Dallas, TX, November 4-10.
- *How can ACTS work for you?* ACTS Toolkit Workshop, Lawrence Berkeley National Laboratory, September 28-30, 2000.
- *Tools for the Development and Solution of Scientific Applications: The ACTS Toolkit*, University of São Paulo, São Carlos, Brazil. August 31, 2000.
- *High Performance Computing: Eigenvalue Calculations and Programming Tools* (short course), PUC/RJ. August 18, 21, 23, 24, 28 and 29, 2000.
- *Singular values/vectors for all occasions: from Seismology to Information Retrieval*, CERFACS, Toulouse, France, July 12, 2000.
- *Accurate Singular Values with dqds*, International Workshop on the Accurate Solution of Eigenvalue Problems, Hagen, Germany, July 3-6, 2000.
- *The ACTS Toolkit (What can it do for you?)*, NUG, Oak Ridge, TN, June 5, 2000.
- *The ACTS Toolkit: An Overview*, NPACI AHM2000, San Diego, CA, February 10, 2000.
- *From Seismology to Web Searches Using Vector Spaces and Supercomputers*, Center for Computational Sciences, University of Kentucky, Lexington, KY, March 31, 1999.

- *Subspace-based Methods for Applications in Geophysics and Information Retrieval*, Colloquia on High Performance Scientific Computation (C3AD'98), Petrópolis, Brazil, August 1998.
- *Singular Values/Vectors (and Alternatives) for Applications in Geophysics and Information Retrieval*, Tera Computer Company, Seattle, WA, March 1998.
- *Large Scale SVD Computations in Linear Geophysical Inverse Problems*, SC97: High Performance Networking & Computing, San Jose, CA, November 1997.
- *Techniques for Eigenvalue Computations (An Overview)*, USP (University of São Paulo, São Carlos), and CEPEL (Center of Research of the Brazilian Electricity Company, Rio de Janeiro). Brazil, September 1997.
- *Large Scale SVD Computations in Linear Geophysical Inverse Problems*. II PanAmerican Workshop of Computational and Applied Mathematics (PWACM II), Gramado, Brazil, September 1997.
- *Eigenvalue Approaches for Large Scale SVD Computations in Linear Geophysical Inverse Problems*, Workshop on the Use of Iterative Methods for Large-Scale Eigenvalue Problems, Argonne National Laboratory, IL, May 1997.

Documented Software:

- BLZPACK (Block LancZos PACKage), for the computation of eigenpairs of symmetric standard or symmetric generalized eigenproblems. Available from the author's website.
- HLZPACK (Hermitian LancZos PACKage), for the computation of eigenpairs of complex Hermitian matrices. Available from the author's website.
- SKYPACK (SKYline PACKage), for matrix-vector multiplication, factorization and solution of systems of equations involving symmetric matrices stored in skyline (or profile) form. In-core and out-of-core versions, available from the author's website.

Grants and Fellowships:

- DOE Field Work Proposal (COMP-98-03), Applied Numerical Linear Algebra. PIs: Horst Simon, Osni Marques and Peter Tang, 1998.
- DARPA grant, Krylov Subspace Methods for Large Scale Eigenvalue Problems and Singular Value Decompositions (SVD's), 1998.
- Research grant from CERFACS, Toulouse, France, November 1994 to November 1996.
- Posdoc fellowship from CIES, Centre International des Etudiants et Stagiaires, Toulouse, France, November 1993 to October 1994.
- Training fellowship from CNPQ (Brazilian Council for Scientific Research), CERFACS, Toulouse, France, October 1992 to September 1993.
- Research grant from FAPERJ (Rio de Janeiro, Brazil), COPPE/UFRJ, Rio de Janeiro, Brazil, September 1991 to August 1992.
- Research grant from PETROBRAS (Brazilian Petroleum Company), COPPE/UFRJ, Rio de Janeiro, Brazil, October 1987 to March 1991.
- D.Sc. fellowship from CNPQ (Brazilian Council for Scientific Research), COPPE/UFRJ, Rio de Janeiro, Brazil, March 1987 to September 1991.
- M.Sc. fellowship from CNPQ (Brazilian Council for Scientific Research), COPPE/UFRJ, Rio de Janeiro, Brazil, March 1984 to August 1986.